| Diploma Programme subject outline—Group 5: mathematics and computer science | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| School name | Hellgate High School | | | | | | School code | 922669 | | |
| Name of the DP subject | Mathematics SL | | | | | | | | | |
| Level  (indicate with X) |  |  | Standard completed in two years | |  | Standard completed in one year \* | | |  |  |
| Higher |  | Standard completed in two years | | x | Standard completed in one year \* | | |  |  |
|  |  | Standard completed in two years | |  | Standard completed in one year \* | | |  |  |
| Name of the teacher who completed this outline | Shane McCorkle | | | **Date of IB training** | | | 11/30/10-12/4/10 | | | |
| **Date when outline was completed** | 12/13/11 | | | **Name of workshop**  (indicate name of subject and workshop category) | | | Mathematics SL | | | |

\* All Diploma Programme courses are designed as two-year learning experiences. However, up to two standard level subjects, excluding languages ab initio and pilot subjects, can be completed in one year, according to conditions established in the *Handbook of procedures for the Diploma Programme*.

1. Course outline

* Use the following table to organize the topics to be taught in the course. If you need to include topics that cover other requirements you have to teach (for example, national syllabus), make sure that you do so in an integrated way, but also differentiate them using italics. Add as many rows as you need.
* This document should not be a day-by-day accounting of each unit. It is an outline showing how you will distribute the topics and the time to ensure that students are prepared to comply with the requirements of the subject.
* This outline should show how you will develop the teaching of the subject. It should reflect the individual nature of the course in your classroom and should not just be a “copy and paste” from the subject guide.
* If you will teach both higher and standard level, make sure that this is clearly identified in your outline.

|  | Topic/unit  (as identified in the  IB subject guide)  State the topics/units in the order you are planning to teach them. | Contents | Allocated time | | | Assessment instruments to be used | Resources  List the main resources to be used, including information technology if applicable. |
| --- | --- | --- | --- | --- | --- | --- | --- |
| One class is |  | minutes. |
| 50 |
| In one week there are |  | classes. |
| 5 |
|  |  |  |
| Year 1 | 1. Algebra | Exponents, logarithms, and their laws, base changes.  Binomial expansion (using GDCs or Pascal’s Triangle).  Arithmetic and geometric Sequences and Series, sum of finite and infinite geometric series. | 10 hours | | | Students will receive informal feedback on daily work, quizzes, unit tests. Some items within these categories will be evaluated by using criterion based assessment techniques used for formal assessment. By using these assessment techniques students will be exposed to the evaluation strategies. The informal assessments for both years of the course will be divided, with 65% of the score allocated from tests, 15% from quizzes, and 15% from daily work. Daily work will be made up of homework practice. This score will be the grade that is assigned to the student’s report card. Students will be strongly encouraged to self-assess throughout the course.  The Formal Assessment in Mathematics SL is divided into two parts, an External Assessment (EA) and an Internal Assessment (IA). The EA is worth includes the writing of two papers. The first is weighted as 40% of the final mark and is a 90 minute paper in which the students are not allowed the use of calculators. The second is also weighted 40% of the final mark and is a 90 minute paper in which requires the use of graphic display calculators.  The remaining 20% of the final mark comes from the Internal Assessment. This is a piece of written work that involves investigating an area of mathematics. Each exploration will be evaluated against 5 criteria. These criteria are communication (0-4), mathematical presentation (0-3), personal engagement (0-4), reflection (0-3), and the use of mathematics (0-6). The report will be introduced several times throughout year one. At the beginning of year two the report will again be introduced and time will be given to explore possible topics and to introduce the rubric. | The student textbook will be:  Garry, Tim, and Ibrahim Wazir. *Mathematics: standard level: developed specifically for the IB diploma*. Harlow, Essex: Pearson Education, 2008.  Stewart, James. *Single variable calculus: early transcendentals*. 6th ed. Australia:Thomson Brooks/Cole, 2008  TI 83 or TI 84 Calculators  Old IB exams and the Math SL Question Bank  Geogebra Software  Fathom Software. |
| 2. Functions and Equations | Concept and notation of functions, composite functions, and inverse functions.  Graphing functions and the use of GDCs, investigation of the key features of graphs, and the graphs of inverse functions.  Transformation of functions.  The reciprocal function.  Quadratic functions and the Quadratic Formula.  Exponential functions and logarithmic functions and their relationship.  Solving Equations graphically and analytically. | 30 hours | | |
| 3. Circular Functions and Trigonometry | The circle, radian measure, and calculating arcs and sector areas.  Solutions of triangles and the cosine and sine rule.  Sine, cosine, and tangent (The Unit Circle).  Trig. Identities.  Graphing circular functions and transformations of circular functions.  Solving trigonometric equations in a finite interval. | 25 hours | | |
| 4. Statistics and Probability | Concepts of population, sample, random sample, discrete and continuous data.  Presentation of data and outliers.  Grouped data.  Statistical Measures and their interpretations, and dispersion.  Cummulative Frequency.  Linear correlation and the correlation coefficient, regression, and predicting.  Definitions in Probability: trial, outcome, equally likely outcomes, sample space (), and event.  Probability equation.  Complementary Events.  Use of diagrams and tables of outcomes.  Combined events, mutually exclusive events, conditional probability, independent events, and probabilities with and without replacement.  Discrete random variables and their probability distributions.  Expected Value (mean), for discrete data.  Binomial distribution and its mean.  Normal distribution and its properties, standardized normal variables. | 45 hours | | |
| Year 2 | 4. Vectors  Research time for Research Report | Vectors as displacements in the plane and three dimensions.  Components of a vector and column representation.  Algebraic and geometric approaches: sums and differences, multiplacation by a scalar, parallel and perpendicular vectors, magnitude, unit vectors, position vectors.  Scalar product of two vectors.  The angle between two: vectors, lines.  Vector equation of a line in 2 and 3 dimensions.  Coincident and parallel lines.  Finding where or determining if two lines intersect.  Time for library use and consultation. | 20 hours  5 hours | | |  |  |
| 6. Calculus | Limits and limit notation.  Definition of derivative and derivative as a gradient funtion and a rate of change.  Tangents, normals, and their equations.  Finding derivatives: product and quotient rule, chain rule, special derivatives.  Second derivative and notation.  Kenematic problems including displacement , velocity , and acceleration .  Graphical behavior of functions: max/min (global and local), increasing/decreasing, concavity, points of inflection and how derivatives affect each of these.  Optimization and applications. | 25 hours | | |
| Research time for Research Report | Time for library use, consultation, and authenticity checks. | 5 hours (1 week) | | |
| 6. Calculus | Indefinite integration as anti-differentiation.  Indefinite integrals.  Integration.  Anti-differentiation with a boundary condition.  Definite Integrals: analytically and using technology.  Areas: under curves, between curves.  Volumes of revolution around the x-axis.  Total distance travelled. | 25 hours | | |

1. IB internal assessment requirement to be completed during the course

Briefly explain how and when you will work on it. Include the date when you will first introduce the internal assessment requirement to your students, the different stages and when the internal assessment requirement will be due.

|  |
| --- |
| I will be introducing the concept of the report to the students in mid-November of the first year. The students will be introduced to the stimuli and the marking criteria and a discussion of possible topics will be included during the rest of the year. At the very beginning of year two the report will be re-introduced with a two week deadline for submitting their topic. Time will be given for research and consultation in mid-October. Time for research, consultation, and authenticity checks will be given at the end of December of semester 3. The report will be due the first day of semester 4, which is in late January. |

1. Links to TOK

You are expected to explore links between the topics of your subject and TOK. As an example of how you would do this, choose one topic from your course outline that would allow your students to make links with TOK. Describe how you would plan the lesson.

|  |  |
| --- | --- |
| Topic | Link with TOK (including description of lesson plan) |
| Calculus (Limits) | Our TOK class will be taught during year 2 of the IB curriculum. Because of this, it will be important to try and link lessons that the students will be studying in Math SL at the time. We will be spending a significant portion of year 2 working on Calculus, so we will link our Calculus lessons with TOK. We will look at limits as they come up in the Math SL curriculum and ask about what value the knowledge of limits will bring us, if any. We will expand this discussion by asking if there are any applications to the study of infinitesimal behavior has any application to real life. |

1. International mindedness

Every IB course should contribute to the development of international mindedness in students. As an example of how you would do this, choose one topic from your outline that would allow your students to analyse it from different cultural perspectives. Briefly explain the reason for your choice and what resources you will use to achieve this goal.

|  |  |
| --- | --- |
| Topic | Contribution to the development of international mindedness (including resources you will use) |
| Algebra (Pascal’s Triangle) | Although Pascal’s Triangle is named after a 17th century western mathmatician, the triangle was actually discovered much earlier in several different parts of the world (not just in the western world). Exploring and discussing this will allow the students to see that math is global and will promote a discussion of why the earlier discoveries are not recognized through being the name bearer’s of the triangle. |

1. Development of the IB learner profile

Through the course it is also expected that students will develop the attributes of the IB learner profile. As an example of how you would do this, choose one topic from your course outline and explain how the contents and related skills would pursue the development of any attribute(s) of the IB learner profile that you will identify.

|  |  |
| --- | --- |
| Topic | Contribution to the development of the attribute(s) of the IB learner profile |
| Calculus | An important part of being a well rounded math student is being able to comminicate using a variety of modes, and also being able to collaborate and work in groups towards a common goal. In small groups, students will be asked to create a 3 dimensional model of a rotational solid, and will present their work to the class using correct mathematical language. The students will also be asked to include a discussion of who they found to be the discoverers of a particular method of volume calculation and to report their findings. |

1. Resources

Describe the resources that you and your student will have to support the subject. Indicate whether they are sufficient in terms of quality, quantity and variety. Briefly describe what plans are in place if changes are needed.

|  |
| --- |
| Mathematics SL formula Booklet  IB Question Bank for Mathematics SL  Larson, Ron. *Algebra 2*. Evanston, Ill: McDougal Littel, 2007.  Stewart, James. *Precalculus: mathematics for calculus*. S.l.: Brooks Cole Pub Co, 2007.  Senk, Sharon L. *Functions, statistics and trigonometry*. 2nd ed. Glenview, Ill.: Scott Foresman Addison Wesley, 1998.  Yates, Daniel S., David S. Moore, and Daren S. Starnes. *The practice of statistics: TI-83/84/89 graphing calculator enhanced*. 3rd ed. New York: W.H. Freeman, 2008.  Burton, David M. *The history of mathematics: an introduction*. 6th ed. Boston: McGraw Hill, 2007.  Microsoft Excel  Microsoft Word  Enzensberger, H.G. 1997. *The Number Devil: A Mathematical Adventure* (Henry Holt and Company)  Abbott, Edwin A. 1979. *Flatland: A Romance of Many Dimensions* (Dover Publications)  TI-Interactive graphing software |